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In re Application of:

Kazufumi OGAWA and Mamoru SOGA

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For: WATER- AND OIL-REPELLING ADSORBED FILM

AND METHOD OF MANUFACTURING THE SAME

DECLARATION UNDER RULE 132

HON. COMMISSIONER OF PATENTS AND TRADEMARKS

WASHINGTON, D.C. 20231

SIR:

I, Kazufumi OGAWA, hereby declare that I reside at 2-3-50, Aoyama, Nara-shi, Nara 630, JAPAN, and I am a citizen and resident of Japan, and hereby further declare as follows:

I was born February 15, 1949, and graduated with a M. S. from the Ehime University, Department of Technology, Ehime, in March, 1973, and took an M. S. in Technology from Ehime University in March, 1975. I then became an employee of

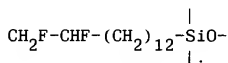
Matsushita Electric Industrial Co., Ltd. I have received a Doctorate in Engineering from the University of Tokyo and a Doctorate in Science from Kyoto University, and have been a chemical researcher and manager. I hold about 64 U. S. Patents, and about 179 U. S. Patent Applications.

Comparison and contrast between the present invention and Kido et al. (U.S.P. 5,011,727), Ogawa et al. (U.S.P. 4,902,585), Ogawa (U.S.P. 4,761,316) and Inoguchi et al. (U.S.P. 4,865,910) are made by directing the experiments mentioned below.

(1) The experiment was directed by following the procedures mentioned by Kido et al. The surface of a slide was treated to have undulations of about $1\mu\text{m}$. After coating the surface with PFA resin (made by Daikin) of $10\mu\text{m}$ and hardening the resin, the contact angle of water on the surface was measured. The apparatus used for measuring the angle was CA-Z Type manufactured by Kyowa Kaimen Kagaku Co., Ltd.

(2) Referring to the example mentioned by Ogawa et al. ('585), a chemical adsorbent, $\text{CF}_3(\text{CF}_2)_7(\text{CH}_2)_2\text{SiCl}_3$, was used to form a chemically adsorbed monomolecular film on the surface of a slide. Then, the contact angle of water on the chemically adsorbed monomolecular film on the slide was measured. The apparatus used for this experiment was the same as the one used for the experiment of (1).

(3) Referring to the example mentioned by Ogawa ('316), a chemical adsorbent, $\text{CH}_2=\text{CH}(\text{CH}_2)_{12}\text{SiCl}_3$, was used to form a chemically adsorbed monomolecular film on the surface of a slide. Furthermore, the slide was treated in a high frequency plasma atmosphere, such as CF_4 containing fluorine, with approximately 10^{-3} Torr. As a result, the chemically adsorbed monomolecular film became as shown below:



(4) An experiment of Inoguchi ('910) similar to the experiment of (2) was conducted, except that a chemical adsorbent, $\text{CF}_3(\text{CF}_2)_7(\text{CH}_2)_2\text{Si}(\text{OMe})_3$, was used instead.

(5) Example 13 of the invention was conducted, and then the contact angle of water on the substrate was measured. The apparatus for measuring the angle was the same as the one used for the experiment of (1).

The contact angles measured in the experiments of (1)-(5) are shown in Table 1.

Table 1

	Kido ('727)	Ogawa ('585)	Ogawa ('316)	Inoguchi ('910)	Present Invention
Contact Angle	105°	115°	108°	105°	155°

The present invention provides a water- and oil-repelling adsorbed film having $-\text{CF}_3$ groups and undulations on its surface.

The water- and oil-repelling adsorbed film of the present invention is provided by forming a chemically adsorbed film on a substrate surface having undulations of over 10 nanometers.

However, Kido ('727), Ogawa ('585 and '316) and Inoguchi ('910) do not disclose a film having -CF_3 groups and undulations of over 10 nanometers on its surface. In addition, their inventions do not show the disclosure of improving water- and oil-repelling properties of a substrate surface by undulating the surface and then covering it with -CF_3 groups.

Kido ('727) discloses one or more layers of fluorine resin films having undulations on its surface. Fluorine resin is a polymer having $\text{-CF}_2\text{-}$ groups as a main chain, and the resin contains few -CF_3 groups. Therefore, $\text{-CF}_2\text{-}$ groups are exposed on the surface of fluorine resin. In other words, unlike a water- and oil-repelling adsorbed film of the present invention, a fluorine resin film disclosed by Kido ('727) cannot have its surface covered with -CF_3 groups. This explanation should be easily recognized in this field. In addition, invention ('727) describes only the improvement of lubricating properties by making a substrate surface undulated, and whether or not water- and oil-repelling properties are improved by the invention is not disclosed.

Ogawa ('585 and '316) disclose a chemically adsorbed film having -CF_3 groups. However, Ogawa ('585 and '316) do not

disclose the improvement of water- and oil-repelling properties by forming undulations of over 10 nanometers on a substrate surface, even though the major point of the present invention is about the formation of a water- and oil-repelling adsorbed film on a substrate surface having undulations of over 10 nanometers.


Inoguchi ('910) does not disclose a chlorofluorosilane-based surface active agent. There is also no disclosure of the formation of an adsorbed film in the invention of Inoguchi. Invention ('910) only mentions the use of a fluoroalkoxysilane-based surface active agent for providing affinity and adhesiveness between glass fiber and fluoro-resin (Col. 1: lines 57-59). Unlike the present invention, a film formed by invention ('910) does not have a regular, even thickness.

Ohno ('917) discloses only a method of providing undulations on the surface of a coating film.

Therefore, different from the present invention which shows in all every examples and drawings the critical improvement of water- and oil-repelling properties on a substrate surface due to the formation of over 10 nanometers undulations on the surface, Kido ('727), Ogawa ('585 and '316) and Inoguchi ('910) do not disclose the improvement of water- and oil-repelling properties on a substrate surface by making the surface undulated and covered with $-CF_3$ groups.

I, the undersigned declarant, declare further that all statements made herein are true and that all statements made are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001, of Title 18, of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Signed this September / , 1993, in Osaka JAPAN


Kazifumi OGAWA